RAPID ACCESS TIRE VALVE FOR A PNEUMATIC TIRE ON A RIM OF A VEHICLE AND CONNECTOR THEREFOR

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The invention relates to valves and more specifically to a rapid access tire valve for a pneumatic tire on a rim of a vehicle and connector therefor to provide a leakage proof connection between the tire and the source of pressurized media in order to inflate or deflate automotive tires and the like in maintenance and repair situations.

DESCRIPTION OF THE RELATED ART

The majority of motor driven vehicles including automobiles, trucks, off-road vehicles, sport utility vehicles, all-terrain vehicles, motorcycles and the like ride on pneumatic tires made of a flexible, elastic, rubber-like material, which is sealingly mounted on a rigid rim. An air or gas mixture contained in the toroidal cavity formed between a tire and a rim is what provides the tire with its smooth ride on a highway or any other level road, its toughness through a desert or mud, and its ability to carry a weight load.

An essential and, by all means, the most critical element of any tire design is the tire stem with a valve core installed in it. The stem and the valve provide access into an otherwise sealed internal tire cavity and at the same time act to keep the air in the tire. Similarly, they serve as the only means of conveying air or other substances into the tire.

Thus, it is extremely important to have ready access to the stem valve during maintenance and for repair purposes, including tire inflation or deflation, and when a gas mixture or other media must be delivered into or evacuated from the tire.

The majority of tire valves are equipped with a tapped inlet nipple. Thus, there is a group of couplers that must be screwed onto the valve stem to form a passage for the air to be conveyed from the air source into the tire. An example of this kind of coupler is disclosed

in U.S. Patent No. 5,305,784. Because of the fine pitch of the stem thread and the mainly rigid connection between the coupler and the hose it is not an easy task to find the beginning of the thread. In addition, after every revolution, the hose becomes twisted and the user is forced to straighten it out in order to be able to proceed with the next revolution. Also, because the process of unscrewing the coupler off the stem is slow and the air passage thus becomes open before the valve stem returns to its closed position, there will always be a substantial amount of air lost after inflation thus making this method imprecise and unfriendly.

U.S. Patent No. 3,926,205 teaches a tire chuck having a long gasket and a lever mechanism which, when moved, compresses the gasket and subsequently opens the tire stem valve. Although the device provides a fast means of making a coupling with a tire stem, it attempts to seal around a threaded surface, which was never proven to be a successful task. Another problematic outcome of this design is that the compression of the gasket necessary to properly seal is about 3 millimeters and the user must overcome the resistance of a 3-millimeter thick layer of rubber and the stiffness of the tire valve spring. Although these types of tire chucks are widely used on various types of tire inflating devices, they were found to be faulty in both the reliable opening of the stem valve and the providing of good sealing properties between the gasket and the surface of the stem thread. Poor control over the proper alignment of the chuck, which must be in place to open the stem valve, adds to the scope of the problems. The user must also perform two actions simultaneously—he must depress the lever while making sure to push the chuck in a direction that opposes the resistance placed on it by the tire stem. Only until the compression of the gasket is sufficient to expand it radially inward, thus providing grip between itself and the threaded surface of the tire stem, can the user finally lock the chuck into place.

U.S. Patent No. 4,276,898 discloses a clip-on type of air chuck which is supposed to seal on the face surface of the stem and at the same time open the stem valve. This chuck uses a lever-type spring-loaded mechanism to lock itself in its operable position using the portion of the lever clenched between the two co-residing threads. These types of chucks use the fine-pitched thread of the stem and thus cannot provide enough holding force for

forming a reliable passage for the air passing from the source of the pressurized media to the tire.

In all of the referenced materials, despite the obvious differences of the devices disclosed, all of them have common and known problems. None of them offer reliable sealing between the chuck and the tire valve. Most do not offer a means of providing proper alignment between the valve inlet nipple and the chuck. Also, they do not offer a reliable mechanism to open and release the stem valve without the loss of a substantial amount of fluid from the tire thus providing no control over sustaining an accurate pressure level inside the tire after inflation, which is extremely important for the safe operation of a vehicle. In addition, there is no locking mechanism provided which can be utilized to gain fast access into the inside cavity of the tire.

Although a tapped inlet has been widely used for an extensive period of time as the only existing means for the attachment of various types of connectors described above onto the tire valve, it is seen as a rudimental element of a tire system and is more of a way of paying tribute to the anachronistic tradition than a practical and trouble-free part of a contemporary mode of servicing pneumatic tires in the modern world.

There is a long-waited need in the field of art to give rapid access to the pressurized air or other gas or fluid substance in the tire so that anyone, from an ordinary motorist to a heroic soldier on the battlefield, can maintain the tire as needed— efficiently without suffering from the above mentioned drawbacks.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the invention to provide an average motorist with a rapid access tire valve for a pneumatic tire on a rim of a vehicle and connector therefor to allow quick and hassle free connecting or disconnecting of the source of the pressurized substance to be delivered into the tire for maintenance or repair purposes.

It is another object of the invention to provide a dependable operating system which, when used, will always form a continuous passage for the substance to flow into the tire or for the substance to be withdrawn from the tire.

It is another object of the invention to provide a simple and user-friendly functioning system through which connecting or disconnecting can be performed even by an unskilled operator.

It is another object of the invention to provide a reliable system, which can withstand high-pressure levels (up to 300 PSI) without abruptly disconnecting from the tire stem or the braking apart.

It is another object of the invention to provide an easily actuatable system through which there is little force needed for the rapid coupler to be connected or disconnected.

It is another object of the invention to provide a leak-free connection between the substance source and the tire valve.

It is another object of the invention to simplify the manufacturing process involved in the valve production by eliminating a thread cutting operation needed to produce a conventional valve stem.

It is another object of the invention to provide a much longer life cycle for the disclosed valve and the corresponding coupler through incomparably higher reliability of the joining elements as compared to the threaded valves and the chucks produced according to the patents mentioned in the description of the related art.

The above and other objects are fulfilled by the invention, which is a rapid access tire valve for a pneumatic tire on a rim of a vehicle and connector therefor and includes a valve, a rapidly acting coupler and a protective cap.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partly sectional side view of a tire valve shows a longitudinal section of a tire valve mounted on a rim of a vehicle. The pressure stop valve is in its closed position.

FIG. 2 is a local view of the flanged end of the valve of FIG. 1 illustrating a variant of the preferred embodiment

FIG. 3 is a local view of the flanged end of the valve of FIG. 1 illustrating a variant of the preferred embodiment

FIG. 4 is a local view of the flanged end of the valve of FIG. 1 illustrating a variant of the preferred embodiment

FIG. 5 is a local view of the flanged end of the valve of FIG. 1 illustrating a variant of the preferred embodiment

FIG. 6 is a longitudinal section of a tire valve mounted on a rim of a vehicle and a connector coaxially aligned and locked, with the pressure stop valve in its open position.

FIG. 7 shows cross section taken on the line 7-7 of FIG. 6

FIG. 8 shows cross section taken on the line 8-8 of FIG. 6

FIG. 9 is a side view of the valve featuring another variant of the installation into the rim of a vehicle

FIG. 10 is a side view of another variant of the claimed valve, but for the tube of a tire, according to claim number 14

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS AND DRAWINGS

Now, turning initially to **FIG. 1**, a preferred embodiment of the valve **101** of this invention comprises a tubular stem **301** having a flanged end **300**, a pressure stop valve **302** of known type, having a spring loaded relief pin **303** and the base of the stem **304** for installation of the valve into aperture **305** of the tire rim **306**.

The preferred tubular rigid valve stem **301** made generally of brass and the base **304**, which is over molded all around it, with exemption of the flanged end **300** of the stem, is made of rubber or a rubber-like material having an adequate flexibility so as to provide one-step, snap-in installation into the tire rim aperture **305**.

The preferred stem **301** has a valve chamber **307** having a screw thread on its inner surface at the bottom of the chamber as to provide secure and leak-free installation of the valve into it. The pressure stop valve **302** is closed under normal operating conditions.

The flanged end **300** of the stem **301** comprises a first cylindrical element **311**, a forward cone portion **312**, flange element **310**, rear cone portion **314** and, following it, cylindrical element **315**.

The two other means for a valve attachment are illustrated by **FIG. 9** and **FIG. 10**

The valve of **FIG. 9** has a one-piece stem **200** having a threaded mounting end **201**, and equipped with two nuts **202** and two seals **203** for secure and leak proof installation onto the tire rim **306**.

The valve of **FIG. 10** has a stem **301** as described below, but with the base **220** configured for vulcanization over a communication aperture of a conventional tube for a pneumatic tire.

Referring now in detail to the drawing **FIG. 6**, an operation of the present invention is also illustrated by way of showing a connector indicated at **102** engaged onto the proposed tire valve **101**. Upon engagement the relief pin **303** of the stop valve **302** is depressed to the open position by the depression pin **36** of the connector. The couplers depression pin **36** has a recess **55** to prevent the stop valve from being damaged due to travel beyond the maximum coupling depression location. Channels **71** in **FIG. 7** are cut through the depression pin body to provide for unrestricted passage of fluid disregarding the otherwise potentially disruptive displacement of the depression pin during operation. The socket **30**, of the coupler **102**, is configured to receive the flanged end **300.** The socket **30** has a circumferential row of spaced-apart orifices **63** in which the detents **38** are held as shown in the cross section in **FIG. 8**. The orifices are shaped as to restrict the radial inward location of the detents. More specifically, this location is restricted to be substantially equal to the diameter of the nose and rear portions of the flanged end **300**. In the illustrated preferred embodiment, the detents **38**, are in the form of spherically-shaped locking elements, which are adapted to releasably engage between the inner surfaces of the collar **84**, and the flange element **310**. The collar **84**, which is coaxially reciprocatably movable along the socket body **30**, restricts the outward radial displacement of the detents to be equal to one-half times of the difference between the diameters of the cylindrical surface of the collar at D and A. The collar **84**, is normally biased forward to its locking position by the spring **37.** The forward movement of the locking sleeve is limited by the retaining ring **81**. With the flanged end **300** of the stem **304**, and connector **102**, coaxially aligned and engaged in the locked position as shown in **FIG. 6**, a passage for a pressurized medium is formed. The depression pin **36**, which is normally biased forward by the spring **33**, opens a stop valve **302**. When the collar is in a retracted

position, the detents are free to move radially outward and to unlock from behind the flange **310**. The present graphic representation of the invention is exemplary and is by no means intended to limit the implementations of the invention to the one described. Therefore **FIG. 2, FIG 3, FIG 4** and **FIG 5** show other possible solutions utilizing other designs of the flanged end of the proposed invention. **FIG. 2** shows a flanged end with a 0-degree forward slope and a 45-degree rear slope while **FIG. 3** shows a flanged end having a 15-degree forward slope and 45-degree rear slope of the cone portions adjacent to the flange element. **Fig. 4** shows a flange element comprising spherical forward slope and rear slope. **FIG. 5** illustrates a flanged end having a flange element with a 0-degree forward slope and a 45-degree rear slope and, following it, a raised cylindrical portion of the same diameter as the diameter of the flange element. Without further analysis and without going beyond and outside the scope of the present claims, it is understandable that others can, by applying current knowledge, adapt the concepts of these claims. Nonetheless, they will not depart from the meaning and range of the present claims.